Application of Advanced Transportation Technology Within Washington State: Discussion and Policy Recommendations

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The Committee for Advanced Technology in State Transportation Policy

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Introduction

As increasing congestion throughout the country creates greater delay, threatens safety, increases energy use, and escalates the daily frustration of motorists, government at all levels is searching for ways to address the problems. One tool that is already proving its usefulness is the application of advanced technology to our surface transportation network. Such technology, referred to as Intelligent Transportation Systems (ITS), is used to gather and process information, provide communication, and manage traffic.

What is ITS technology? The national ITS program is directed toward applying computer, information systems, and telecommunications technology to improve the movement of people and goods on the surface transportation system. Some applications have proven effective and are widely used today, in Washington State and throughout the country. Other promising applications have been extensively tested and are just beginning to be deployed in limited ways in some areas. Finally, some ideas are in the research and analysis stage and are years away from widespread, effective application.

This range of development, from proven systems to theoretical concepts, illustrates the need for a focused and coherent policy encompassing technical exploration, operational tests, and large-scale field deployment. Further, the nature of the information and telecommunications technologies involved require new working relationships among various levels of government, cooperation with private industry, and attention to legal issues such as product liability and individual privacy. Institutional and legal barriers must be addressed, and both public investment and private financing and support must be obtained.

This policy paper overviews Intelligent Transportation Systems technology. It includes the objectives in applying ITS, the kinds of technologies involved, the participants needed to make ITS work; a discussion of benefits that jurisdictions around the country are deriving from its use; and an explanation of the current planning for deployment of ITS in Washington state. In the last chapter, the paper presents policy recommendations for dealing with issues such as the state's commitment to ITS, risk management, partnerships, and protection of privacy.

I. Advanced Transportation Technology: An Overview

A. Advanced Technology

In basic terms, advanced technology is the application of computer, information systems and telecommunications technologies either separately or, increasingly, together to improve the service to the user.

B. Advanced Technology Related to Transportation

As early as the 1950s and 1960s, as the Interstate Highway System was just being developed, transportation industry experts were envisioning self-guided automobiles, traveling on guideways, that delivered their passengers to their destinations automatically without a driver. While these concepts were thought at the time to be far-fetched, in the mid-1990s technology has advanced to the point of making these “smart cars” and “smart highways” a near reality, including dashboard maps to guide drivers to their destinations and automatic breaking systems to avoid collisions. The same computer and telecommunications technology that has revolutionized the workplace, and will soon revolutionize our homes, will also be applied to our transportation systems to improve safety, efficiency, and compliance with environmental requirements. When applied to transportation systems, these technologies are generally referred to as **Intelligent Transportation Systems (ITS)**.

C. Intelligent Transportation System Applications

Intelligent Transportation Systems can be described in six broad categories:

Advanced Traffic Management Systems (ATMS)

ATMS applications make traffic flow more efficiently, and many of these applications are already in place. One example is a computer controlled signal system. These systems allow traffic to flow smoothly, at a fixed speed, down an arterial without stopping at a red light, or adjust a single signal’s cycle length depending on how many vehicles are using the intersection. Another example is a ramp meter on a freeway that limits how many vehicles can enter the freeway based on measurements of how many vehicles are already upstream. Such ramp meter systems can smooth out the flow on the freeway by regulating merge rates, thereby increasing freeway speed and capacity. A final example is an incident management team. Through improved communications, emergency response crews can respond soon after a collision or breakdown, minimizing the delay experienced by other travelers on the roadway.

ATMS require some means of collecting traffic data (loops in the pavement and/or cameras), computer systems for analyzing those data, and a means of adjusting the operation of the system to reflect current traffic conditions. As computer systems and telecommunications continue to advance, many more applications that improve the efficiency of traffic movement will be possible.

Advanced Traveler Information Systems (ATIS)

ATIS are based on the premise that when more information on system conditions is available to travelers, they will adjust their time, route, or mode of travel to their own advantage, which will also improve system efficiency. Simple forms of ATIS are radio traffic reports that let drivers know about backups and collisions, and highway advisory radio broadcasts for special conditions. More advanced applications include traffic flow maps and transit operations information accessible over the Internet from home or work; in-vehicle navigation systems that provide drivers with maps, traffic flow information and directions on how to reach their destinations; and traffic condition information broadcast to personal communications devices (pagers, smart watches, cellular telephones, etc.).

ATIS applications require detailed system operations information, which may be generated from Advanced Traffic Management Systems, and a means to communicate that information in various forms to the traveler. The private sector already plays a significant role in communicating ATIS information to various users. This role is likely to grow as more sophisticated navigation systems become available in automobiles.

Advanced Vehicle Control Systems (AVCS)

AVCS get the closest to the 1950s vision of self-guided automobiles. While completely automatic cars probably won't be available on the market within the next twenty years, many AVCS technologies are either available now or soon will be marketed in automobiles. Available now are anti-lock braking, traction control, and dynamic skid control. On the horizon are such applications as adaptive cruise control, which will automatically decelerate the car upon approaching a slower vehicle; drowsiness detectors that will sound a wake-up call when needed; infrared night vision systems; and lane warning sensors that will warn a drifting driver. Further in the future are automatic collision avoidance systems, which relieve the driver of some or all control of the vehicle. These will be similar to autopilot systems in airplanes. Fully automated highways will require not only in-vehicle computer controls, but also in-highway equipment that will guide vehicles to their destinations. These in-vehicle technologies will be provided by automobile manufacturers as fast as the market demands them, provided that the highway infrastructure is in place to accommodate such systems.

Advanced Rural Transportation Systems (ARTS)

ARTS include applications that address the special needs of the rural traveler. These include automatic SOS signaling that reports a vehicle's location and the severity of an emergency or accident; systems that help vehicles safely pass other vehicles on two-lane roadways; and systems that help drivers detect animals or other objects on the roadway. On-board navigation systems will also help intercity travelers find their way.

Advanced Public Transportation Systems (APTS)

These include applications that are specific to improving the efficiency and user-friendliness of public transportation services. They include improved information systems to disseminate schedule, fare, and ride-sharing information more conveniently to users through the Internet and other real-time media; automated fare collection systems that eliminate the need for exact change; and vehicle locator systems for improved fleet management, increased security, and communicating to riders the exact arrival time of the next bus.

Commercial Vehicle Operations (CVO)

Public sector regulation of trucking for weight control, licensing, and permitting causes delays for truckers, which increase the cost of delivering goods. ITS applications for commercial vehicles are aimed at minimizing unnecessary stops for trucks. Technologies include automatic vehicle identification to allow truckers with all needed permits to by-pass ports of entry; weigh-in-motion scales to screen vehicles so that trucks that are legally loaded do not have to stop at scale houses; electronic placarding/bill of lading to monitor the movement of hazardous materials; and automatic collection of tolls on toll roads. An added benefit of commercial vehicle ITS applications is that trucking firms can use the information generated to better manage their fleets and improve just-in-time delivery to reduce transportation costs.

To better understand how these six general categories will benefit transportation customers, the national ITS community has defined user services that describe the capabilities of ITS.

The complete list of the 29 user services, grouped into seven categories, is presented in Appendix A, along with a brief description of each. The seven categories listed in Appendix A represent a different way to define the benefits of ITS and therefore do not relate on a one-to-one basis with the six categories described above.

D. Proven Effectiveness of ITS Applications

Across the United States and the world, ITS applications have proven their effectiveness in improving transportation safety, efficiency, and customer service. Some examples of these applications follow.

- A six-year study of the Seattle area freeway management system, which includes ramp metering showed that, despite traffic growth of 10 percent to 100 percent along I-5, speeds remained steady or increased up to 48 percent, and accident rates fell to 62 percent in comparison to the base period. The improvements occurred while average metering delays at each ramp remained at or below 3 minutes.

- The Minnesota DOT's Traffic Management Center, which operates freeways in the Minneapolis area, reports that capacity has risen to 2200 vehicles per hour per lane from 1800 before the use of the ramp meters. Average speeds have risen from 34 mph to 46 mph. Before management on I-35W, accidents averaged 421 per year; they have since dropped to 308 per year. Before management, annual accident experience on I-35W was 3.4 collisions per million vehicle miles traveled; after management it is 2.11.

- The Fuel Efficient Traffic Signal Management and the Automated Traffic Surveillance and Control programs in California showed benefit/cost ratios of 58:1 and 9.8:1, respectively. Automated Traffic Surveillance and Control, which includes computerized signal control, reported a 13 percent reduction in travel time, 35 percent reduction in vehicle stops, 14 percent increase in average speed, 20 percent decrease in intersection delay, 12.5 percent decrease in fuel consumption, 10 percent decrease in hydrocarbons, and a 10 percent decrease in carbon monoxide.

- The FAST-TRAC program in the Detroit, Michigan, area reported that, as a result of the installation of traffic management system that included the SCATS adaptive signal control system and related improvements to intersection geometrics, certain types of accidents were virtually eliminated. During the study period injury accidents decreased 6 percent, injuries decreased 27 percent, serious injuries decreased 100 percent, and left turn accidents decreased 89 percent. At the same time, peak hour, peak direction speeds increased 19 percent and intersection delay decreased by up to 30 percent.

- Use of several popular traveler information projects is growing. The Los Angeles Smart Traveler project set up 78 information kiosks in locations such as office lobbies and shopping plazas. During this evaluation, the number of daily accesses ranged from 20 to 100 in a 20-hour day, with the lowest volume in offices and the greatest in busy pedestrian areas. The most-frequent request (83 percent of users) was for a freeway map showing traffic conditions. Over half of the users requested bus and train information. WSDOT's Internet-accessible freeway map showing Seattle area traffic conditions is visited thousands of times a day.

- Surveys performed in the Seattle, Washington, and the Boston, Massachusetts, areas indicated that 30 percent to 40 percent of travelers frequently adjust travel patterns on the basis of travel information. Of those who change travel patterns, about 45 percent change their route of travel and another 45 percent change their time of travel; an additional 5 percent to 10 percent change their travel mode.

- The impact of Boston's SmarTraveler on emissions has been modeled, given the assumption that 30 percent of daily callers would change their travel plans. On a daily basis, this adjustment in travel behavior would reduce carbon monoxide by 33 percent. Although only 28,800 daily trips are expected to be affected in a metropolitan area with 2.9 million registered drivers, it represents significant reductions in pollutants by the participating travelers.

- Rail transit systems in San Francisco and Washington, DC, have been using magnetic stripe fare cards since the 1970s. Several pilot programs are testing newer electronic fare payment techniques. For example, an experiment involving 2400 rail travelers has been testing the use of radio frequency cards in the Washington, DC, system since February 1995. In California, tests comparing various card technologies have found that fare cards that use radio frequency to communicate are highly reliability. A test in the Marseilles, France, metropolitan area is comparing radio frequency and infrared technologies that would allow patrons to use the card of their choice (credit card, debit card, monthly pass) for transportation payment. In addition to gaining popularity, electronic fare payment has benefited fare collection and data collection,

- Phoenix, Arizona, transit operators have used electronic fare payment techniques since 1991. In response to an air quality bill passed by the Arizona state legislature in the late 1980s, the county encompassing Phoenix passed a travel reduction ordinance that required each employer in the Phoenix area with over 100 employees to reduce single-occupancy commuting trips by 5 percent in 2 years. The City of Phoenix Public Transport System led development of the Bus Card Plus system, which uses magnetically encoded plastic passes that enable the system to collect data that benefits the commuting program and helps reduce operational problems. Currently, 190 companies participate, and 35,000 cards are in use. The employers of those using the cards are billed monthly for their use. On express bus routes 90 percent of fares are paid by card. Processing fees have totaled under 7 percent of revenue generated, and no major problems have been encountered. In similar programs, New Jersey Transit estimates an annual cost reduction of $2.7 million in cash handling, and Atlanta estimates $2 million in savings.

E. The Implications of ITS for transportation programs

The computer revolution has and will continue to touch all of our lives, regardless of whether or not we individually choose to embrace the technology. The same can be said for transportation systems. Following are several implications of advanced technology, and specifically ITS, for transportation programs:

Operations versus construction focus

ITS applications have great potential to improve the operating efficiency and safety of our surface transportation systems. However, transportation programs have historically been dominated by large-scale construction activity, with operational-type improvements taking a back seat for funding and attention. The implementation of advanced technology applications will require a change in this construction focus, with a significant up-front commitment to installation of these operational systems, and continued commitment to day to day operations and maintenance.

Overcoming jurisdictional boundaries

ITS needs to be implemented on a system basis, regardless of jurisdictional control of specific facilities, and across public sector/private sector lines. Historically, however, the jurisdictional funding of our transportation programs has led to each jurisdiction making individual investment decisions that may not optimize the efficiency of the system.

Service to the customer

Most ITS applications are intended to improve transportation services for customers, whether those services are improved traffic information, more certainty in bus or train arrival times, or fewer unnecessary stops for commercial trucks. Many ITS applications, especially the Automatic Vehicle Control Systems, will be marketed to the public by private firms, and those with the most consumer appeal will be implemented first. Transportation agencies will have to remain keenly aware of these consumer trends, identify the applications that have a public benefit, and be willing and able to adapt the transportation infrastructure to accommodate or support those advanced technologies that have a public benefit and that the private sector can effectively market.

Making our highways smart

While fully automated highways may be still a long range vision, transportation agencies need to recognize the tremendous social and cost implications of converting our basic transportation structure to a more interactive, customer-oriented "smart" system. On the social side, does the public really want some level of external control over their driving behavior, even if that control means increased safety and efficiency? On the cost side, a fully implemented "smart" highway or transit system is probably akin to building another interstate system, not to mention the increased cost to consumers of smart vehicles. Although ITS will probably be implemented incrementally, transportation agencies need to discuss these social and cost implications with the public and to agree to some long-range vision of an ITS future.

II. ITS: The National Program

A. The National Evolution of Intelligent Transportation Systems

Over three decades ago, precursors to some of the user services included under today's advanced transportation technology umbrella began appearing in America's cities. Since then their implementation has become more flexible, capable, and integrated. Isolated ramp meters have developed into freeway management systems in metropolitan areas such as Los Angeles, Houston, San Antonio, and Seattle. Many cities aside from Seattle, such as Detroit and Atlanta, are building or expanding traffic management centers that include freeway management components. Incident management programs that began as courtesy patrols and CB monitoring have incorporated new technologies such as motorist call boxes, cellular phone call-in, loop detectors, live video and image processing techniques and are being integrated into transportation management centers. Transit fleet management has also evolved from managers with radios and clipboards to dispatch centers that receive real-time automatic vehicle location information. Electronic fare payment is expanding from magnetic fare card use by the Washington, DC, METRO and San Francisco BART rail systems to systems that also accept commercial credit cards and other electronic transaction devices. Electronic toll collection systems are being installed both in urban areas and on rural roadways.

B. ITS and ISTEA: The Development of a National Umbrella

Up until 1991, many jurisdictions across the country were implementing advanced transportation technologies, but without any formal national coordination, standards, or strategic direction. In 1991, Congress enacted the Intermodal Surface Transportation Efficiency Act of 1991, which restructured federal transportation programs and, for the first time, established a federal advanced technology program under the title “Intelligent Vehicle-Highway Systems” (IVHS). In the law, Congress established national goals for the IVHS program, required USDOT to develop a strategic plan for IVHS development and implementation, and authorized a USDOT grant program for IVHS planning and operational testing. The term IVHS was later changed to Intelligent Transportation Systems (ITS).

In 1992 IVHS America (now known as ITS America) developed the Strategic Plan for Intelligent Vehicle-Highway Systems (IVHS) in the United States, which established the goals and objectives for a national ITS program. At the same time, the United States Department of Transportation further defined the goals, milestones, and objectives of the national ITS program with its Intelligent Vehicle-Highway System Plan. This effort was followed by the development of a program, called simply the ITS Plan, by the National Highway Traffic Safety Administration to reduce traffic accidents, injuries, and fatalities.

From these efforts the United States Department of Transportation and ITS America developed the National ITS Program Plan in 1995. The National ITS Program Plan is the current guidance for the development of ITS. Specifically, it describes the national ITS program, ensures that the intermodal aspects of ITS are considered, guides investment decisions, promotes coordination between the public and private sectors, provides a strong focus on ITS deployment, provides assistance in local policy decisions, and facilitates a national program assessment.

C. The ITS National Structure

ITS embodies an array of technologies, but the challenges it poses are not solely technical. Organizational, institutional, and legal issues must be resolved before significant implementation can take place. ITS will require cooperation among all levels of local, state, and federal government, the private sector, and academia. For ITS to succeed, participants must together

- agree on an overall mission and direction
- provide stable funding and management
- develop public/private partnerships
- adopt appropriate standards and protocols
- educate transportation professionals, decision makers, and the public.

Below are descriptions of the major ITS players and their respective responsibilities in accomplishing these tasks.

ITS America

The lead role in the design of a national program of ITS research, development, and deployment belongs to the Intelligent Transportation Systems Society of America (ITS America). Its mission is to stimulate interest and activity in ITS and to foster and coordinate the needed public/private/academic partnerships. ITS America is a forum in which the private and public members of the ITS community can meet to reach consensus and take action to accelerate implementation of the technology. As a Federal Advisory Committee to the U.S. Department of Transportation, it helps guide the federal government's ITS activities and advises the U.S. Department of Transportation on establishing program priorities.

Federal Government

The federal government provides a national perspective to ITS. Federal spending is the required catalyst for private and local spending. The U.S. Department of Transportation has the key responsibility for encouraging and coordinating the development of ITS technology in conjunction with state and local governments, private industry, and academia. The U.S. Department of Transportation commissions research, funds demonstrations and operational tests, assures the uniformity of evaluations, encourages implementation, and ensures that systems are nationally compatible when required.

The Federal Highway Administration's Joint Program Office has been designated the lead agency for the ITS program. Other key U.S. Department of Transportation offices involved in advanced technology are the National Highway Traffic Safety Administration, the Federal Transit Administration, Federal Railroad Administration, and the Research and Special Programs Administration.

State and Local Government

State and local governments are responsible for building, operating, and maintaining surface transportation systems, as well as for managing traffic. This makes their participation in ITS fundamental to its success. If state or local governments ignore or reject advanced technology, it will fail.

The state owns the Interstate highways, U.S. highways, and other state highways. Local governments own arterials and local roads. Many transit systems are owned by either state or local governments or by multi-jurisdictional agencies. State and local governments will install, maintain, and operate the ITS infrastructure, or they will possibly contract out these functions to the private sector. State and local governments in neighboring jurisdictions must find new ways to cooperate in order to develop and install advanced technology. Moreover, when systems will reach across jurisdictional boundaries, cooperation will be required to operate them.

Academia

Academia will help by assessing the current state of likely technological improvements and by performing basic and applied research and development and operational tests. Universities must also develop academic programs that will educate a new type of transportation professional, one schooled in the disciplines and concepts fundamental to

ITS. These include, for example, communications, computer science, systems engineering, and institutional studies. In other words, academia must develop new concepts and knowledge germane to ITS and must integrate new academic disciplines with transportation.

Private Sector

The private sector's role in ITS will be fundamental. Industry will make by far the largest investment in ITS, but only given the promise of profits. The private sector is in the best position to understand the marketing of ITS because it will develop the technologies that will make ITS products and services a reality. Advanced technology will be a significant business opportunity for auto makers and for companies in the electronics, computer, communications, and information industries.

Although significant private investment will be required for ITS, government funding is also needed to encourage the private sector to develop consumer products and services that have potential for significant public benefit, and to make the infrastructure responsive to these new technologies.

III. ITS Planning in Washington

A. Background

Washington has started to implement ITS. Application of advanced technologies to Washington's transportation system is not a recent occurrence. In the 1960s some of the parts of what is now called ITS, coordinated traffic signal systems and closed circuit television cameras, were already in use on Washington roads and highways. During the '70s, '80s and early '90s, actuated and interconnected traffic signals, ramp metering, radio traffic advisory reports, programs such as FAME (Freeway and Arterial Management Effort), and demonstration projects such as HELP (Heavy vehicle Electronic License Plate) all promoted implementation of technologies on Washington's transportation system. Use of advanced technologies helps the state, counties, and cities control traffic on their roadways and allows public transportation providers to manage their systems. These technologies often provide information to the system managers that, if accessible in a timely manner, can aid system users in making travel choices and improve the efficiency of the whole system. The opportunity to use data collected for ATMS to improve ATIS is a synergy that will not happen without planning. The formal planning to capture the benefits of this synergy began in 1992.

B. Venture Washington - Strategic Plan

In 1992, the WSDOT sponsored a multi-jurisdictional effort called Venture Washington to develop a strategic plan to implement IVHS in Washington state. Guided by WSDOT and the IVHS Resource Group, which included local government representatives, consultants developed a strategic plan that included a public information program. Completed in 1993, the strategic plan has two dimensions.

First, the plan describes five program elements embraced as part of IVHS implementation in Washington. The five program elements are Public Transit/Transportation Demand Management, Traveler Information, Traffic Management, Freight and Fleet Management, and Additional Services. Of the six national ITS areas, Washington's program elements embrace five: advanced traffic management systems, advanced traveler information systems, advanced rural transportation systems, advanced public transportation systems, and commercial vehicle operations. The plan does not, at this time, recommend that advanced vehicle control systems, or the highway investments needed to support these "smart" cars, be an active part of Washington's ITS program.

Second, the plan recognizes that the state of Washington encompasses a unique blend of geographical regions, and the plan presents a staging of needs that differs for each region. The five geographic categories are the Central Puget Sound, Spokane, Vancouver, other urban areas, and intercity/rural. The plan concentrates the use of ITS in the most highly congested urbanized areas, where the largest return on investment will be available in the near term. The plan also recognizes that in the long term all areas of the state can benefit from ITS so applications for small urban and rural areas are included. The strategic plan addresses the next 20 years and beyond. Many of the actions proposed by the plan are continuations of work already under way. Other applications proposed by the plan will not be operational for many years.

The Venture Washington strategic plan represents the first step in the deployment of advanced transportation technology within the state. The next step is to pinpoint problems along particular transportation corridors and to recommend specific technological solutions to solve these problems. This process is taking shape through corridor analysis projects. These projects are identifying specific current and future problems along important statewide roadway corridors and then developing detailed project prospectuses for the construction and deployment of technological solutions to these problems. The recommended projects that emerge from these corridor studies will be programmed through the state's budget process to provide funding for eventual construction and deployment. Throughout this process, research and investigation will provide the necessary knowledge and experience to proceed wisely with each project. Each project will be built upon the foundation of systems already in place and will be a step toward our future transportation system.

C. Venture Washington - Short Range Action Plan

Using the Venture Washington strategic plan as a base, the WSDOT developed a Short Range Action Plan for implementing advanced transportation technology. The program areas developed for the action plan are

- comprehensive traffic management
- coordinated communications
- extensive traveler information systems
- roadway performance monitoring
- efficient traffic control systems
- alternatives to single occupancy vehicles
- improved safety

- enhanced commercial vehicle operations
- transportation corridor analysis.

For each of these program areas, projects have been identified at three levels of technological risk. These levels are evaluation, testing or proof of concept, and deployment. Deployment, the lowest level of technological risk, uses proven technologies. These projects are funded through normal budget processes. The second level of risk involves demonstration or field test projects. These projects test technologies to confirm the benefits that can be derived from them. The funding for demonstration projects normally leverages state funds with other funds from variety of sources. These are primarily federal but include local, transit, and private sector sources as well. The third risk level involves projects to evaluate unproven technologies to determine whether theoretically possible technologies have cost-effective, practical application. These projects are normally funded as academic research or through research and development ventures of private sector firms.

The complete version of the Venture Washington Short Range Action Plan can be found in Appendix B. This lists Washington State Department of Transportation's ITS goals for the state; the current projects that are underway, completed, or deployed; and the envisioned next steps for the program. The Short Range Action Plan is dynamic, intended to change as needs are realized, lessons are learned, and technology changes. Any policy adopted on the application of advanced technology will help shape the Short Range Action Plan as it changes.

IV. Issues, Discussion, and Policy Recommendations

The application of advanced technologies to transportation programs in Washington raises some policy issues that need to be addressed. There are four main issues:

- Washington's commitment to ITS
- partnerships
- risk management
- protection of citizen privacy

Although these issues are not necessarily unique to Washington and do not represent a comprehensive list of potential issues on a national scale, they are the most important here and drive the need to develop state policy on ITS. The following sections describe each of these issues and recommend policy statements to guide ITS implementation in Washington.

A. Washington's Commitment to ITS

Discussion

It is clear that advanced transportation technology has both proven and potential benefits for travelers in Washington. It will maximize the return on our existing infrastructure investment, will make the system more "user friendly," and will provide traditional transportation benefits such as improved mobility, safety, economic competitiveness, environmental quality, and reduced vehicle operating and infrastructure costs. However, existing transportation programs may not promote ITS implementation for a number of reasons. These are outlined below.

ITS: The Role of Government versus Individual Control and Privacy

A primary concern over ITS technology implementation is that these systems require government agencies to collect information and manage of transportation systems, at a time when government's role in many areas is being questioned. Although government's role in traffic operations has been accepted in the past, many new ITS technologies require information about individuals, their travel patterns and their vehicles which raise privacy concerns. As vehicle control technologies advance, additional questions will arise regarding the role of government or corporations in controlling how individual vehicles operate on the system. These issues of control and privacy have no easy solution. As these technologies advance continuing public dialogue will be necessary to ensure that citizens are comfortable with new roles for government and with the selected methods of deployment.

Single Jurisdiction Focus

To date, ITS applications have been implemented largely by individual jurisdictions. The state has implemented freeway management systems; cities and counties have individually applied advanced technologies to their arterial signal systems; and transit agencies have implemented fleet locator systems. However, traffic operates across jurisdictions. In order to gain further effectiveness from ITS technologies, and to optimize service to the traveling customer, government and private entities will have to work together to implement systems across jurisdictional boundaries. Most existing transportation programs, with their single jurisdictional focus, do not promote the implementation of projects that have more than one owner. Some early pilot projects have been facilitated by special federal grants, but ongoing multi-jurisdictional implementation of these programs must rely on jurisdictions either pooling funds from existing funding sources or creating new cross-jurisdictional funding programs.

Two examples exist of cross-jurisdictional transportation project funding in Washington. In 1990, the Transportation Improvement Board was created to fund multi-jurisdictional congestion and economic development projects. In 1991, Congress enacted the Intermodal Surface Transportation Efficiency Act (ISTEA), which contained a Surface Transportation Program. An operating principle of this Surface Transportation Program is multi-jurisdictional project selection, carried out by Metropolitan Planning Organizations. Washington has been moving toward increased multi-jurisdictional project selection processes, but most funding programs remain jurisdiction-specific, and there is no multi-jurisdictional program oriented toward traffic operation.

Construction/expansion focus

Another issue is that transportation programs have historically been oriented toward construction and expansion activities. Operational improvement projects have not received equal attention.

There are several reasons that may explain this. First, benefits from operational improvement projects have been less clearly proven than those from traditional transportation improvements. Methods for measuring these benefits have improved over time, so operational improvements are becoming more acceptable. Second, operational systems usually require an up-front capital investment. These are followed by ongoing operational costs, which are often largely due to rapidly evolving electronic components and computer control systems. Finally, transportation agencies, especially during the

Interstate era, have had a culture of expansion, often with little expertise in or attention paid to system management. However, limited transportation budgets have changed agencies emphasis to doing more with less, leading to an increased focus on operational solutions to transportation problems.

With better measurement of operational benefits, a better understanding of the life-cycle costs of these systems, and concern with doing more for less, operational improvements will continue to become more important aspects of our transportation programs.

Customer Service Orientation

Many ITS applications move beyond traditional transportation “hardware," providing travelers and their vehicles with information that will make their trips safer and more convenient. Knowing what the customer wants, and tailoring the ITS program to changing customer demands, will require changes in the way that transportation agencies operate. Information on customer demands will need to come from direct surveys, focus groups, and other customer contact, as well as keen monitoring of privately marketed products that distribute ITS information for customer convenience. Embracing ITS technology will require transportation agencies to expend the resources and develop the skills necessary to both measure customer demands and respond quickly to those demands.

Conclusion

The benefits of implementing advanced technologies on our transportation systems outweigh the costs and the risks. Our transportation institutions and financing arrangements should be adjusted to promote ITS implementation in Washington as a solution to transportation problems and as a service to the transportation customer.

Policy Recommendations

- Aggressively pursue the application of advanced technology to transportation systems in Washington.
- Continue WSDOT’s lead role in coordinating the statewide implementation of ITS technology, working collaboratively with cities, counties, transit agencies, other state agencies, and the private sector, and consistent with the state ITS strategic plan, “Venture Washington.”
- Place a higher priority and greater level of commitment, across all transportation agencies in Washington, on transportation programs that improve operational efficiency

through advanced technology. Operational improvements should be given consideration equal to that given to infrastructure expansion in meeting mobility needs.

B. Partnerships

Discussion

For many of the state and national ITS projects and programs currently underway, both public and private organizations are cooperating to develop, deploy and evaluate new applications. The role of the private sector is essential in the national program, and in Washington State as well.

Private Partners

First, the private sector has the expertise to determine products desired by the public and to produce and market those products at attractive prices. The in-vehicle devices related to ITS are being developed, produced, and marketed by the private sector. Similarly, devices that enable individuals to receive current, useful traveler information (for example, bus arrival times, freeway congestion at certain locations, winter mountain pass conditions) are, and will continue to be, primarily by private sector products. Car radios, personal computers connected to the Internet, and television are examples of such products and systems. As new types of useful information become available and new products and techniques for delivering that information are developed, the private sector will continue to invest in product design, evaluation, production facilities, and marketing.

Second, the private sector has developed, fully understands, and has already deployed most of the existing ITS technology, but for applications other than transportation. Personal computers, cellular phones, high-speed communication networks, geographic locator systems, and smart cards for fee payments are examples of ITS technologies, but the devices have been fully proven and extensively deployed for other purposes. Private industries thorough understanding of these technologies is essential for modifying and deploying them quickly and effectively for transportation systems.

Third, the private sector is willing to invest in developing and modifying devices and systems where potential new markets and opportunities exist. This investment can be beneficial and complementary to public investment in ITS research, development, and deployment. Transportation is a subject of significant public interest and impact, and it constitutes a significant market opportunity for private firms. Inclusion of private partners in specific projects can provide a portion of the required funding. Because the private partners will invest only in areas that have potential, this is not only a method of acquiring funds but also an indication of project viability.

In recognition of the strong role of the private sector in ITS development and deployment, the federal ITS program emphasizes the role of the private sector, and federal funds strongly encourage private participation in individual projects. Financial participation, e.g. investment, is specifically sought.

Partnerships with private companies are governed by a substantial amount of state and federal law. Such laws are designed to assure fair competition and to prevent the misuse of public funds. As the WSDOT and other agencies proceed with ITS projects, a careful review of individual contracts and agreements to assure compliance with these laws and to protect the public interest will continue to be required.

Public Partners

A premise of the federal ISTEA legislation and the Washington State Transportation Policy Plan is that transportation systems connect intermodally and interjurisdictionally. Shippers and travelers take advantage of city streets, state highways, intercontinental air and water routes, rail lines, and various forms of public transportation to reach their destinations. It is not of major interest or consequence to shippers and travelers which government entity owns or operates the facilities on which they travel. Therefore federal, state, city, county, and special-purpose districts that own and operate transportation facilities must collaborate to effectively deploy ITS technology and to realize its benefits.

Among the agencies that have a significant role in ITS deployment are state law enforcement and regulatory agencies such as the Washington State Patrol, the Department of Licensing and the Traffic Safety Commission. In addition, city and county transportation agencies, law enforcement agencies and public transportation agencies have major roles. Ports can have significant roles in some CVO that directly affect freight movement and the avoidance of passenger bottlenecks. Federal agencies clearly include the USDOT but can also include, in some instances, the US Immigration Service and Customs, when international border crossings are involved.

Again, the federal ITS program encourages partnerships among various federal, state, and local agencies, and USDOT provides assistance in establishing these agreements where federal agencies are involved.

Coordination Efforts

The WSDOT has recognized the need for partners, both public and private, and the requirements for partnerships set forth by the USDOT in the federal ITS program. WSDOT is actively participating in the establishment of an organization called ITS Washington. This organization, chartered under the auspices of ITS America, will provide a forum in which participants can explore opportunities, identify partners for specific tests and implementation activities, and identify solutions to obstacles.

Conclusions

Partnerships among public agencies are essential for achieving the maximum benefits from ITS technologies, and such partnerships should be aggressively pursued.

Partnerships between the public sector and private companies can substantially increase the speed and effectiveness of ITS technology development and deployment, and should be aggressively pursued.

Policy Recommendations

- Transportation agencies in Washington should
  - Be aggressive in forming partnerships among state, federal, and local agencies where relevant. Such partnerships assure integrated applications across modes and jurisdictions, speed deployment, and leverage the investment of each individual agency.
  - Seek dedicated funding and grants to implement intergrated ITS applications through partnerships among public agencies.
  - Be aggressive in seeking and forming partnerships with private companies that have technological resources and knowledge applicable to ITS applications. Such partnerships provide access to the creativity, technological ability, and marketing prowess of the private sector; leverage public investment; and speed deployment of ITS applications. If necessary, seek changes in statute to allow WSDOT to receive revenues from partnerships with private companies.
  - Protect the public interest by promoting competition among private sector providers.
  - Require a significant benefit to the public in any public/private technology partnership.

C. Risk Management

Discussion

ITS technologies range from those that have been fully tested and proven in applications around the country and the world to applications that are in the stages of conceptual research and proof of concept. Within this range, many ITS technologies have been well researched and some have been field tested in limited applications. As the state of Washington develops and deploys these technologies, some level of uncertainty is involved in some applications. The uncertainty may involve benefits, costs, and operational effectiveness. A rational strategy for managing the uncertainty of new technology and of new approaches to proven technology is required.

Exploratory Research

Research and experimentation are needed to explore initial concepts and to determine technical feasibility, potential applications and possible benefits. Generally, this type of research is performed by universities or national laboratories and funded at the national and/or international level. Some of the Advanced Vehicle Control Systems (AVCS) program elements are in this phase of exploration and development. The private sector-- notably auto manufacturers, communications companies and computer companies-- have a definite interest in and financial commitment to these early research findings. California has also been a leader in this area, exploring control and vehicle management technology and highway management methods.

Applied Research

After specific applications have proven feasible and when significant benefits appear probable in specific areas, an applied research project, sponsored locally, is often appropriate. Applied research is meant to tailor the application to local conditions and to permit local experts to evaluate potential uses. The experiment or study should be thorough and objective and should directly involve those who would use the technology if it was implemented. The “users” include state and local traffic engineers as well as travelers and shippers as appropriate.

If applied research proves successful, the next rational step is a limited field test to see how the technology operates in the field and to generate an objective assessment of capital and operating costs, benefits, and public acceptance. This limited field trial can also form a basis for determining staff training needs, if any.

Implementation

Finally, as a concept is successively proven to be technically feasible, locally beneficial and operationally practical in successive stages, a full implementation can be programmed with considerable confidence in the effectiveness and benefits, while accurately estimating capital or initial costs as well as ongoing maintenance and operational costs.

Federal Perspective

At each step in the process described above, minimum investments are made so that if the concept proves unsuccessful, too expensive, or unsuited to local/regional needs, it can be abandoned at minimum cost. On the other hand, as the technology or concept is successively analyzed and refined, practical and objective assessments and adaptations to local conditions can be made, and the uncertainty associated with new technology can be reduced or eliminated.

The federal ITS program recognizes this uncertainty and supports the approach described above to reduce and/or eliminate it. The USDOT funds conceptual, exploratory research to a significant extent and awards research funding to universities, private research organizations, and national laboratories for this sort of research. Progress reports and research results are disseminated in various ways, often through technical papers and presentations in forums such as meetings of ITS America and the Transportation Research Board (TRB).

The USDOT also provides supplemental funding to state and local transportation agencies to do evaluations, field tests, and applied research on the emerging technologies that seem most promising. Again, results are widely disseminated so that the entire transportation community can stay abreast of developments.

Finally, the USDOT provides funding for accelerated implementation in test cases around the country; substantial matching funds are also required from state and local sources for these deployments, but the USDOT provides funding for objective evaluations and for workshops, publications, and other methods of disseminating the results of these projects. The recent awards to WSDOT for projects such as SWIFT, PuSHME, and Travelaid are examples of this type of program.

The intent of this federal program structure is to substantially accelerate the research, development, and practical application of new ITS technology. The program provides funding incentives to tailor the technology to local needs and conditions, to widely disseminate study and field test results, and to thereby reduce the uncertainty of deploying these technologies while still implementing them as quickly as possible.

Conclusion

The current national ITS technology program, in which the federal government has a strong role in developing concepts through research and implementation of promising or proven technologies at the state and local levels, provides opportunities for developing, improving and implementing new technology quickly, but with minimum uncertainty (risk) to state and local agencies.

Policy Recommendations

- Transportation agencies in Washington should minimize the uncertainty and risk in deploying new ITS technology by pursuing the following strategies:
  - Aggressively pursue the implementation of applications that have proved effective through research, demonstration projects, and broadscale deployment elsewhere.
  - Demonstrate applications supported by substantial research and indications of strong demand, but whose benefits have not yet been fully documented; seek federal and other funding to maximize the benefits of state and local funds in proceeding with such demonstrations.
  - Monitor applications and projects nationwide that have the potential to create substantial benefits for travelers, shippers, and transportation agencies.
  - WSDOT should seek to involve relevant staff in the national ITS program to both stay informed of the newest technologies and to shape the development of these technologies to assure that they will provide maximum benefit to the state.

D. Protection of Citizen Privacy

Discussion

Since some ITS systems collect, use, and electronically store information to effectively manage traffic and inform travelers, questions regarding access to that information, and thus personal privacy, have been raised.

For example, automatic toll collection systems require that information regarding the time and date that a vehicle passed a toll station be retained for billing and bill verification purposes. However, that record could be used for secondary purposes, such as law enforcement investigations. Questions arise about this secondary use: Under what conditions should the electronic data files be made available to law enforcement officials? What prior consent is required before an individual is issued an automatic toll collection sensor? Can other agencies, public and private, access the data files under Freedom of Information principles?

At the national level, ITS America is developing Fair Information and Privacy Principles. These are designed to respond to the growing concern that privacy issues are being ignored in a rush to deploy Intelligent Transportation Systems solutions. The following principles have been adopted by ITS America in 'draft final' form and will go to the organization's Legal Issues community before full incorporation. Below is a summary of the principles.

Individual Centered. ITS must recognize and respect the individual's interests in privacy and the use of information in systems.

Visible. Intelligent transportation information systems will be built in a manner "visible" to individuals. In other words, individuals should be fully informed about the data collected and how those data will be used.

Comply. ITS will comply with state and federal laws governing privacy and information use.

Secure. All ITS information systems will use data security technology and audit procedures appropriate to the sensitivity of the information.

Law Enforcement. ITS will have an appropriate role in enhancing travelers' safety and security interests, but absent consent, government authority, or appropriate legal process, information identifying individuals will not be disclosed to law enforcement. ITS systems should not be used as a surveillance means for enforcing traffic laws, although individuals are concerned about public safety. Persons who voluntarily participate in ITS programs or purchase ITS products have a reasonable expectation that they will not be "ambushed" by information they are providing.

Relevant. ITS will only collect personal information that is relevant for ITS purposes.

Secondary Use. ITS information coupled with appropriate individual privacy protection may be used for non-ITS applications.

Freedom of Information. Federal and state Freedom of Information Act obligations require disclosure of information from government maintained databases. Database arrangements should balance the individual's interest in privacy and the public's right to know.

ITS America says that the principles are "advisory, intended to educate and guide transportation professionals, policy makers and the public as they develop fair information and privacy guidelines for specific intelligent transportation projects." The organization also recommends that "enforceable provisions for safeguarding privacy in their contracts and agreements" be included in ITS deployments.

Conclusion

Transportation agencies in Washington State should design, construct, and operate ITS technologies in a manner that protects the privacy of individuals.

Policy Recommendations

- WSDOT and other transportation agencies in the state should follow the guidance provided by ITS America in its draft Fair Information and Privacy Principles when developing, implementing and operating ITS Systems.
- WSDOT should actively work with the State Attorney General to assure that current state law and guidance regarding Freedom of Information and individual privacy issues are fully understood, and that safeguards are incorporated in ITS applications. If necessary, WSDOT should propose changes to statute to protect citizen privacy when using ITS applications.
- WSDOT should monitor developing privacy standards, assist in developing those standards, and support standards that ensure the privacy of travelers.

V. References & Appendices

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APPENDIX A
ITS USER SERVICES

User services define the capabilities that ITS will provide to customers. The national ITS community's planning activities currently identify 29 user services in seven categories. While still evolving, these user services collectively define near-, mid-, and long-term ITS capabilities

Travel and Traffic Management

- *En-Route Driver Information.* Improves convenience and efficiency with driver advisories and in-vehicle signing.
- *Traveler Services Information.* Provides a reference directory or "yellow pages" of service information.
- *Route Guidance.* Provides travelers with instructions on how to efficiently reach their destinations.
- *Incident Management.* Helps officials quickly identify incidents and implement a set of procedures to minimize their effects on traffic.
- *Traffic Control.* Manages the movement of traffic on streets and highways.
- *Emissions Testing and Mitigation.* Provides area-wide pollution information for monitoring air quality and for framing air-quality improvement strategies.

Public Transportation Management

- *En-Route Transit Information.* Provides information to travelers using public transportation while they are on their trips.
- *Personalized Public Transit.* Flexibly routes transit vehicles, offering more convenient service to customers.
- *Public Travel Security.* Creates a more secure environment for public transportation patrons and operators.
- *Public Transportation Management.* Automates operations, planning, and management functions of public transit systems.

Commercial Vehicle Operations

- *Commercial Vehicle Electronic Clearance.* Facilitates domestic and international border clearance, minimizing stops.
- *Automated Roadside Safety Inspection.* Focuses on improving safety in commercial vehicle operations.
- *Commercial Vehicle Administrative Processes.* Enables electronic purchasing of credentials and automated mileage and fuel reporting.
- *On-Board Safety Monitoring.* Senses the safety status of a commercial vehicle, cargo, and driver.
- *Commercial Fleet Management.* Provides communications between drivers and dispatchers for efficient routing.
- *Hazardous Material Incident Response.* Provides immediate notification of an incident and immediate request for assistance.

Electronic Payment

- *Electronic Payment Services.* Allows payment for transportation related transactions without cash.

Emergency Management

- *Emergency Vehicle Management.* Keeps track of available resources and directs them to incidents, reducing response time.
- *Emergency Notification and Personal Security.* Provides immediate notification of an incident and immediate request for assistance.

Travel Demand Management

- *Pre-Trip Travel Information.* Provides information for selecting transportation modes that best suit travelers' needs.
- *Ride Matching and Reservation.* Helps increase the attractiveness of shared-ride transportation.
- *Demand Management and Operations.* Manages access to roadways, supporting policies and regulations such as the 1990 Clean Air Act Amendment.

Advanced Vehicle Control and Safety Systems

- *Longitudinal Collision Avoidance.* Prevents head-on and rear-end collisions with other vehicles and pedestrians.
- *Lateral Collision Avoidance.* Prevents collisions by preventing vehicles from leaving their own lane and entering an adjoining lane occupied by another vehicle.
- *Intersection Collision Avoidance.* Prevents collisions involving right-of-way violations at intersections.
- *Vision Enhancement for Crash Avoidance.* Improves the driver's ability to see the roadway and obstacles.
- *Safety Readiness.* Provides warnings regarding the condition of the driver, vehicle, and roadway infrastructure.
- *Pre-Crash Restraint Deployment.* Anticipates an imminent collision and activates passenger safety mechanisms before the collision.
- *Automated Highway Systems.* Fully automates vehicles on instrumented highways, significantly improving today's safety, efficiency, and comfort standards.

APPENDIX B
VENTURE WASHINGTON SHORT RANGE ACTION PLAN

In order to plan for the future the Washington State Department of Transportation has developed a strategic plan for implementing advanced transportation technology. Venture Washington is the program that will make the strategic plan a reality. This ITS strategic plan addresses the next 20 years and beyond. Many of the actions planned are continuations of work already under way. Other planned applications will take many years before they are operational.

The ITS strategic plan recognizes that the state of Washington comprises a unique blend of geographical regions, and it is structured to address the differing needs of each.

The Venture Washington strategic plan represents the first step in the deployment of advanced transportation technology within the state. The next step is to pinpoint problems along particular transportation corridors and to recommend specific advanced transportation technology solutions to solve these problems. This process will be done through the studies of the state's major ground transportation corridors. The solutions will then be programmed into the state’s budgeting process to provide funding for eventual construction and deployment. Throughout this process, research and investigative efforts will provide the necessary knowledge and experience to proceed wisely with each project. And each built upon the foundation of a system already in place, will be a step toward our future transportation system.

COMPREHENSIVE TRAFFIC MANAGEMENT

Complete and extend our data collection and Surveillance, Control and Driver (SC&DI) information systems.

Goals

- Expand and complete the Seattle area SC&DI system, including the fiber optic communication system.
- Install SC&DI systems and fiber optic-based communications systems in Tacoma and Vancouver.
- Install the first elements of a wireless SC&DI system in the Spokane area. This will be eventually expanded to a complete regional SC&DI system.
- Install solar powered and other stand alone systems, such as cellular call boxes and data stations and wireless closed circuit television to provide comprehensive and real-time information on selected rural roadway sections.

Current or Completed Efforts

Evaluation Studies/Research Projects

- *Improve Congestion Prediction Algorithm* used predictive techniques to improve ramp control algorithms and *Improve Error Detection and Incident Detection Using Prediction Techniques and Video Imaging* improved identification of bad detector data and improved our knowledge of the relationship of volume and lane occupancy to traffic speed.
- *Improve Error Detection for Induction Loop Detectors Using Correlation Techniques* improved induction loop accuracy and has led to a possible incident detection algorithm.
- *Investigation of Automatic Vehicle Location Systems for Traveler Information* used Metro Transit Automatic Vehicle Location data to improve information available to travelers and transportation managers
- *Options for Monitoring Traffic Congestion in Washington's Urban Area* developed recommendations on alternatives for implementing traffic congestion monitoring systems.
- *Incident Response Evaluation* will look at the effectiveness of the state's incident response teams.

Technology Test/Proof-of-Concept Projects

- "Autoscope" and "Mobilizer" *Video Detection Projects* demonstrated technology to replace or supplement loop detectors for data collection.
- *Ramp Control via Neural Network Control* developed and tested a new ramp metering algorithm by using an artificial neural network congestion predictor and a multi variable control system and *Fuzzy Logic Ramp Metering* project will test this ramp metering algorithm both by using models and in the field.
- *Investigation of GPS and GIS for Traveler Information* investigated the feasibility of combining the advanced technologies of both vehicle location and digital geographic information systems to produce a better tool for real-time traffic monitoring.
- *Incident Management Framework Demonstration* demonstrated a procedure for developing an incident management plan for the Tacoma area.

Deployment

- *Improved Travel Time Estimates* improved the process of estimating speeds from loop data.

- *Test and Analysis of AVI for Congestion Management and Travel Information* is testing a loop-based Automatic Vehicle Identification system prototype on the North I-5 corridor using Community Transit buses.
- *Incident Response Data Base* will develop a database to be used in evaluating incident response measures developed and implemented in the Seattle area. The database will be used statewide.
- *Incident Response Guide* developed the procedures for the statewide incident response program.
- *In-Vehicle Signing and Variable Speed Limit IVHS Demonstration*, known as Travel Aid will improve safety on a 40-mile section of I-90 across Snoqualmie Pass by implementing one of the first rural traffic management systems in the nation.

The Next Steps

- Complete the *North Seattle ATMS Integrated Signal System Project*.
- Develop an Advanced Traffic Management System (ATMS) plan for the Vancouver, Washington, region.
- Develop an Advanced Traffic Management System plan for the Spokane region.
- Implement a Port of Tacoma Advanced Traffic Management System.
- Demonstrate a rural SC&DI system in the Centralia area to detect delays from construction, incidents, and weather.

COORDINATED COMMUNICATIONS

Design and install a statewide communications system to enable exchange of data and video between Surveillance, Control and Driver Information (SC&DI) systems and to support statewide ITS projects.

Goals

- Link the Tacoma and Seattle area SC&DI systems.
- Link the Vancouver and Portland SC&DI systems.
- Complete the following studies and implement the recommendations for the:
  - Seattle to Spokane Corridor Study
  - Seattle to Vancouver, BC, Corridor Study
  - Portland to Boise Corridor Study.

Current or Completed Efforts

Evaluation Studies/Research Projects

- *Seattle to Portland Intercity IVHS Corridor / Statewide IVHS Plan* has identify ITS needs and develop a communications plan for the I-5 corridor from Seattle to Portland.
- *Investigation of Two-Way Wireless Digital Information for ATIS/ATMS Developmen*t developed a framework in which to understand, select, and apply wireless data communications technology to ITS.
- *IVHS-Network and Data Fusion* will generalize from specific, regional issues investigated in other, related projects by creating key network and fusion components that are transferable to other regions and countries.
- The *I-5 Seattle to Vancouver BC & I-90 Seattle to Spokane Intercity Urban/Rural ITS Corridor* projects will identify ITS needs and develop a communications plan for the respective corridors.

Technology Test/Proof-of-Concept Projects

- *IVHS Backbone Design and Demonstration* will design, construct and demonstrate an architecture for a regional fiber optic ITS backbone for the Puget Sound area.
- *Traffic Data Acquisition and Distribution* , or TDAD, will provide a regional multi-agency data base of traffic information to permit jurisdiction to better work together when planning transportation improvements.

The Next Steps

- Maintain and enhance the ITS communications backbone between WSDOT's Seattle area Traffic System Management Center, the University of Washington, and Puget Sound area cities.
- Develop proposals with Washington State Patrol for statewide corridor communications systems.

EXTENSIVE TRAVELER INFORMATION SYSTEMS

Deliver roadway information to users in homes, offices, shopping areas, recreational sites, and en-route.

Goals

- Provide pre-trip traveler information to a variety of delivery systems to include telephone, television, radio, computer, and in-vehicle devices.
- Provide en-route traveler information to a variety of platforms to include cellular phone, radio, transportable computers, and in-vehicle devices. This information may be

delivered by various carriers, including wireless phone, radio sub-carrier, and other broadcast media.

Current or Completed Efforts

Evaluation Studies/Research Projects

- *Demonstration of ATIS/ATMS Data Fusion in a Regional IVHS* and *Impact Assessment of Advanced Traveler Information Systems in the State of Washington* assessed advanced traveler information systems.

Technology Test/Proof-of-Concept Projects

- *Real-Time Traveler Information System,* known at Traffic Reporter, will provide delivery of the system for public use and will evaluate the system under actual use.

The Next Steps

- Complete the *SWIFT Operational Test of En-route Driver and Transit Information Delivery*.
- Consider the results of the *Herald Operational Test* of an AM sub-carrier, being conducted by ENTERPRISE, for application within Washington.
- Develop a multi-modal traveler information center and test it at transportation hubs statewide.
- Test the feasibility and determine the use ability of delivering traffic surveillance video over the Internet.
- Establish *Intermodal Terminal Information Kiosks* at rail stations along the I-5 corridor.
- Develop an advanced *Seattle to Portland I-5 Corridor Traveler Information System.*

ROADWAY PERFORMANCE MONITORING

Establish a performance monitoring system that will use data collected from around the state.

Goals

- Equip bus fleets with Automatic Vehicle Identification(AVI) and Automatic Vehicle Location(AVL) systems to function as data probes.
- Equip a sample population of passenger vehicles to function as probes.
- Establish consistent monitoring of truck volumes and movements.

Current or Completed Efforts

Evaluation Studies/Research Projects

- *Travel Time and Vehicles as Probes Research*, an Enterprise project, will investigate using vehicles tagged for AVI to replace or supplement current data collection methods.
- *Options for Monitoring Traffic Congestion in Washington's Urban Area* developed recommendations on alternatives for implementing traffic congestion monitoring systems.

Technology Test/Proof-of-Concept Projects

- "Autoscope" and "Mobilizer" *Video Detection Projects* demonstrated technology to replace or supplement loop detectors for data collection.

Deployment

- *Test and Analysis of AVI for Congestion Management and Travel Information* is testing a loop-based AVI system prototype on the North I-5 corridor using Community Transit buses.
- *Community Transit Arterial System Area—Wide Priority* will use buses as probe vehicles to collect arterial traffic information.

The Next Steps

- Develop an AVI standard for the Puget Sound region.
- Investigate the use of Metro Transit's AVL system for providing arterial travel times.

EFFICIENT TRAFFIC CONTROL SYSTEMS

Encourage regional coordination of traffic operations.

Goals

- Share traffic data and video among agencies.
- Coordinate traffic signals on arterials across jurisdictional boundaries and with freeway traffic management systems.
- Coordinate incident detection and response across jurisdictional boundaries.

Current or Completed Efforts

Deployment

- *North Seattle Advanced Traffic Management System* (ATMS) will develop a central database to share both freeway and arterial traffic control data among jurisdictions in the Seattle to Everett corridor.

The Next Steps

- Secure funding for ATMS systems for the areas east and south of Seattle to mirror the efforts of the ongoing North Seattle ATMS project.
- Implement the recommendations for ATMS projects developed in the *Seattle to Portland Corridor Study*.
- Design, deploy and evaluate a *Pierce County Advanced Traffic Management System*.

FOSTER USE OF ALTERNATIVES TO SINGLE OCCUPANCY VEHICLES

Apply advanced technology to encourage transit use, provide ride sharing incentives, and facilitate use of alternative modes.

Goals

- Provide regional transit traffic signal priority.
- Provide real-time transit and ride sharing information to commuters at home before their trips, at transit centers, and en-route.
- Provide comparative travel time information for general purpose lanes and high occupancy vehicle lanes.
- Investigate applications of advanced technology to improving non-motorized transportation.

Current or Completed Efforts Evaluation **Studies/Research Projects**

- *Impact of Driver-Controlled Traffic Lights on Kitsap County Transit* evaluated the use of Opticom traffic light equipment on traffic lights in the city of Bremerton for transit priority.
- *HOV Lane Usage Analysis and Evaluation Tool* developed a methodology for evaluating HOV lane use and *HOV Lane Evaluation and Monitoring* produced the first annual HOV system evaluation based on the developed methodology.

Technology Test/Proof-of-Concept Projects

- *Bellevue Smart Traveler: Using Traveler Information to Reduce Downtown SOV Commuting* will produce, implement, and test a Traveler Information Center prototype designed to increase the use of transit and paratransit by downtown Bellevue office workers.
- “Autoscope” and “Mobilizer” *Video Detection Projects* demonstrated technology to replace or supplement loop detectors for data collection, and *Volpe Video License Plate Project* tested the use of video cameras to observe vehicle license plates for computing travel times.

Deployment

- *Test and Analysis of AVI for Congestion Management and Travel Information* is testing a loop-based Automatic Vehicle Identification (AVI) system prototype on the North I-5 corridor using Community Transit buses.
- *Increasing Awareness of Transportation Options Through Riderlink Project* will produce, implement, and test a Traveler Information Center prototype designed to increase the use of transit and paratransit.
- *Riderlink* provides ride share information on Metro bus route schedules and maps, ride matching services, HOV lane use, and ferry schedules over the internet.

The Next Steps

- Implement SWIFT Smart Traveler, the dynamic ride sharing component of the Seattle Wide-area Information for Travelers (SWIFT) operational test project.
- Enable SWIFT portable computer device to provide transit and traffic congestion information.
- Work with Metro Transit on its Trip Planning Project.
- Begin Metro Transit and Community Transit Advanced Traffic Management System *Arterial System Area-wide Priority* (ASAP) transit priority projects.

IMPROVED SAFETY

Increase traveler safety.

Goals

- Establish a statewide emergency Mayday system.
- Develop automatic incident detection and response systems.
- Promote the development of innovative in-vehicle technology to reduce rear-end, sideswipe, and run-off-the-road accidents

Current or Completed Efforts

Evaluation Studies/Research Projects

- *NEXRAD: NEXt Generation Weather RADar* is investigating potential transportation applications for the new Doppler weather radar.
- *Seattle to Portland Intercity IVHS Corridor Study*, and *I-5 Seattle to Vancouver BC & I-90 Seattle to Spokane Intercity Urban/Rural ITS Corridor Study* will identify ITS solutions to potential safety problems along these important corridors.

Deployment

- *In-Vehicle Signing and Variable Speed Limit IVHS Demonstration*, known as Travel Aid will improve safety on a 40-mile section of I-90 across Snoqualmie Pass by displaying variable speed limits and other safety messages based on traffic and roadway conditions.

The Next Steps

- Completion of the *Pushme Mayday Operational Test* of emergency traveler communications systems.
- Look at the results of the Colorado Mayday Test, being conducted for ENTERPRISE, for application within Washington.
- Test a system to provide corridor weather information to motorists using the Seattle to Portland corridor, as recommended in the *Seattle to Portland IVHS Corridor and Communication Study*.

ENHANCED COMMERCIAL VEHICLE OPERATIONS

Increase the efficiency of commercial goods movements throughout the state.

Goals

- Develop paper less and automated systems for permitting, weighing, and safety inspections.
- Share permitting and credential databases between adjacent states.
- Support national efforts to develop hazardous materials tracking systems.
- Support the development of innovative in-vehicle technology to increase truck operations safety.

Current or Completed Efforts

Evaluation Studies/Research Projects

- *Truck Brake Condition Safety Research* is investigating ways to predict heavy truck brake failure in time to allow the driver to take action.
- *Investigation of Truck Restrictions* investigated various truck restrictions on the state's freeways, recommended demonstration of the most viable restrictions, implemented the selected restrictions, and evaluated the results.
- *Washington State Ferries Static/Variable Message Signage* is looking at ways to improve communicating real time ferry vessel arriving and departure times and terminal wait times to vehicles as they approach terminals.

Deployment

- *HELP/Crescent Project* implemented ways to improve truck mobility along the West Coast and including border crossings with Canada.
- *Western States Transparent Borders Project* studied and recommended ways to remove the barriers that limit the implementation of ITS that could improve truck transport in seven western states. (WA, OR, ID, MT, WY, NV, & UT)

The Next Steps

- Install weigh-in-motion stations in conjunction with recommendations of the HELP project.
- Conduct a study of ways to improve freight movement through congested corridors.